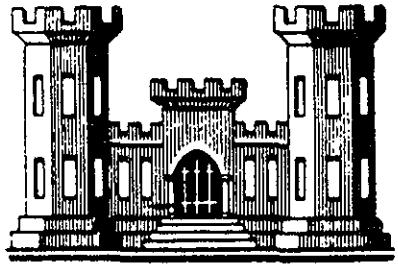
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY
LOCAL PROTECTION

NAUGATUCK RIVER, CONNECTICUT

DESIGN MEMORANDUM NO.4

CONCRETE MATERIALS



U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

FEBRUARY 1966

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

IN REPLY REFER TO:

NEDED-D

16 February 1966

SUBJECT: Ansonia-Derby Local Protection Project, Naugatuck River, Connecticut - Design Memorandum No. 4 - Concrete Materials

TO: Chief of Engineers
ATTN: ENGCW-E

There is submitted herewith, for review and approval, Design Memorandum No. 4, Concrete Materials, for the Ansonia-Derby Local Protection Project, Housatonic River Basin, in accordance with EM 1110-2-1150.

FOR THE DIVISION ENGINEER:

John Wm Leslie

JOHN Wm. LESLIE
Chief, Engineering Division

Incl (10 cys)
Des Memo No. 4

FLOOD CONTROL PROJECT

ANSONIA-DERBY LOCAL PROTECTION PROJECT
NAUGATUCK RIVER
HOUSATONIC RIVER BASIN
CONNECTICUT

DESIGN MEMORANDA INDEX

No.	Title	Date Submitted	Date Approved
1	Hydrology and Interior Drainage	30 Apr 65	16 Jun 65
2	Omitted		
3	General Design and Site Geology	14 Jan 66	
4	Concrete Materials	16 Feb 66	
5	Omitted		
6	Embankments, Foundation and Channel Improvements		
7	Detailed Design of Structures		
8	Pumping Stations		
9	Hydraulic Analysis		

ANSONIA-DERBY LOCAL PROTECTION PROJECT

ANSONIA-DERBY, CONNECTICUT

DESIGN MEMORANDUM NO. 4

CONCRETE MATERIALS

CONTENTS

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

OFFICE OF THE DIVISION ENGINEER

WALTHAM, MASSACHUSETTS

FLOOD CONTROL PROJECT
ANSONIA-DERBY LOCAL PROTECTION PROJECT
CONNECTICUT

DESIGN MEMORANDUM NO. 4

FEBRUARY 1966

1. General. The project, located in the City of Ansonia and the Town of Derby, Connecticut, will require approximately 38,000 cubic yards of concrete for construction of flood walls, pumping stations and a pressure conduit. The concrete will be subjected to severe climatic conditions with alternate cycles of freezing and thawing during the winter months; therefore, for durability, air-entrained concrete is considered mandatory. The flood walls will require structural concrete. The pumping stations and pressure conduit, which are subjected to high velocity flows of water, will require superior structural concrete. In view of the moderate quantity of concrete involved, the specifications will provide for use of a semi-automatic concrete plant with concrete mixed by a stationary or paving mixer.

2. Cementing Materials. The sizes of the monoliths will not result in excessive thermal stress nor does the location of the structures involve sulfate exposure; therefore, the use of Type I portland cement will satisfy the requirements for this project.

With the amount of concrete required, it is not considered economically feasible to use pozzolan or special cements. No special investigation of portland cement was conducted, as cement in this area is usually supplied by one of seven cement mills located in the New York Hudson River Valley or from one of eight mills located in the Pennsylvania Lehigh Valley. Six of the seven mills located in the New York Hudson River Valley do not manufacture Type I portland cement, but do manufacture Type II, and one mill also manufactures portland blast furnace slag cement. Therefore, Type I or II portland cement and Type IS portland blast furnace slag cement will be specified.

3. Aggregate.

a. Field Investigation. In view of the relatively moderate quantity of concrete involved, the concrete aggregate investigation was confined to established commercial aggregate sources. A field reconnaissance (May 1965) was performed by an engineer-geologist team to determine the available sources of concrete aggregate within a fifteen mile radius of the project site. There are nine commercial sources of processed sand and gravel, and three commercial sources of processed crushed stone within a fifteen mile radius of the project site. Table 1 lists the sources and location, plant capacity, and haul distance to the project site.

TABLE 1

Source and Location	Plant Capacity (Tons per Hour)	Haul Distance (Miles)
Derby Sand & Asphalt Co., Derby, Connecticut	125	2
Grasso Construction Co., Shelton, Connecticut	75	7
Leverty & Hurley Company Beacon Falls, Connecticut	120	7
D'Addario Sand & Gravel Co., Oxford, Connecticut	180	8
Hamden Sand & Gravel Co., Beacon Falls, Connecticut	160	8
Beard Sand & Gravel Co., Milford, Connecticut	170	11
D. J. Carten Sand & Gravel Co., Milford, Connecticut	120	12
C. W. Blakeslee & Sons, Inc.(1) Hamden, Connecticut	100	12
A. N. Farnham, Inc.(1) Ndw Haven, Connecticut	100	12
Woodbury Supply Company Woodbury, Connecticut	250	16
Waterbury Sand & Gravel Co., Prospect, Connecticut	100	20
New Haven Trap Rock Co.,(1) North Branford, Connecticut	1200	21

(1) Produce Crushed Stone

The location of the project and the commercial sources of aggregate are shown on Plate 4-1. The Derby Sand and Asphalt Company

and Grasso Construction Company both obtain their materials for processing by dredging the Housatonic River and use the processed material primarily in bituminous concrete. D. J. Carten Sand & Gravel Company and Beard Sand and Gravel Company also obtain their material for processing by dredging the Housatonic River, but use the processed material primarily in transit mixed concrete. The State of Connecticut Highway Department does not approve the use of concrete utilizing aggregates obtained by dredging the Housatonic River. Hamden Sand and Gravel Company is owned by the Leonard Concrete Pipe Company and the processed material is used primarily in the manufacture of concrete pipe. A. N. Farnham, Incorporated is presently operating a quarry adjacent to C. W. Blakeslee, Incorporated, that is almost exhausted. Leverty and Hurley Company, D'Addario Sand and Gravel Company, C. W. Blakeslee & Sons, Incorporated, and Woodbury Supply Company were selected for evaluation testing as having the best potential for supplying concrete aggregate. Beard Sand & Gravel Company was also selected for evaluation testing because they operate a transit mix concrete plant in Derby, Connecticut within a two mile haul distance from the project site. Material from this source used for evaluation testing was obtained from a terrace deposit located on the Orange-Milford town line and not from the river dredging. Waterbury Sand & Gravel Company and New Haven Trap Rock Company have been previously tested and approved for civil works construction. Photographs of working faces of C. W. Blakeslee, Incorporated and New Haven Trap Rock Company are shown on Plates 4-12 and 4-13 respectively. The

maximum size coarse aggregate commercially available is two inches. Because of the placing condition in relatively narrow, heavily reinforced walls and slabs, an aggregate size larger than 1-1/2 inches is not being considered.

a. Tested Sources and Estimated Prices. The sources of aggregate tested and estimated delivered prices of aggregate, based on quoted plant prices and Connecticut Department of Public Utilities minimum trucking rates, which are currently thirty-five cents per ton for the first four miles and six cents per ton for each additional mile, are as follows:

(1) Leverty and Hurley Company. Quoted plant prices are $1.90 to $2.50 per ton for gravel, depending on size group; and $1.60 per ton for concrete sand. The delivered prices to the site will average $2.75 per ton for gravel and $2.20 per ton for sand.

(2) D'Addario Sand and Gravel Company. Quoted plant prices are $1.50 to $1.70 per ton for gravel, depending on size group; and $1.10 per ton for concrete sand. The delivered prices to the site will average $2.10 per ton for gravel and $1.70 per ton for sand.

(3) Beard Sand and Gravel Company. Quoted plant prices are $3.00 to $3.10 per ton for gravel, depending on size group; and $2.00 per ton for concrete sand. The delivered prices to the site will average $3.80 per ton for gravel and $2.80 per ton for sand.

(4) C. W. Blakeslee and Sons, Incorporated. Quoted plant prices are $1.85 to $3.00 per ton for crushed stone, depending on size group. The delivered price to the site will average $3.30 per ton for crushed stone.

(5) Woodbury Supply Company. Quoted plant prices are $2.00 to $2.80 per ton for gravel, depending on size group; and $1.45 per ton for concrete sand. The delivered prices to the site will average $3.40 per ton for gravel and $2.50 per ton for sand.

(6) Waterbury Sand and Gravel Company. Quoted plant prices are $2.25 to $2.50 per ton for gravel, depending on size group, and $1.25 per ton for concrete sand. The delivered price to the site will average $3.65 per ton for gravel and $2.55 per ton for sand.

(7) New Haven Trap Rock Company. Quoted plant prices are $1.75 to $3.00 per ton for crushed stone depending on size group. The delivered price to the site will average $3.80 per ton for crushed stone.

c. Aggregate Tests. Results of aggregate tests are summarized on Plates 4-2 through 4-6. Test data on New Haven Trap Rock Company and Waterbury Sand and Gravel Company are reported in Technical Memorandum No. 6-370 "Test Data - Concrete Aggregates in Continental United States", Volume 5, New Haven is listed under Latitude 41°N, Longitude 72°W Index No.12 (rev.) and Waterbury is listed under Latitude 41°N - Longitude 73°W, Index No. 6.

d. Concrete-Making Properties of Aggregates. The water cement ratio and cement factor vs. compressive strength curves are shown on Plates 4-7 through 4-11 for all sources except Waterbury Sand and Gravel Company and C. W. Blakeslee and Sons, Incorporated.

e. Service Records. The aggregates from the tested sources have been used in concrete in a number of Federal, State and local projects. Leverty and Hurley Company has supplied sand and gravel aggregates regularly to a transit mix concrete company with plants located in Beacon Falls and Waterbury, Connecticut, and concrete from these plants has been used in construction of local buildings and state highway bridge construction on Route 8 in Seymour and Route I84 in Waterbury. The D'Addario Sand and Gravel Company have supplied sand and gravel aggregates regularly to their concrete plant located in Bridgeport, Connecticut and concrete in local building construction, including buildings at the University of Bridgeport and University of Fairfield and for bridge structures on the Connecticut Turnpike in Bridgeport. Beard Sand and Gravel Company has supplied concrete for local construction from their plants located in Milford and Derby, Connecticut, including the construction for raising of Stevenson Dam in Oxford, Connecticut. C. W. Blakeslee and Sons, Incorporated has supplied concrete for local construction from their plants located in Hamden and New Haven, Connecticut, including building at Yale University and State Highway bridge and pavement on Route I91 in New Haven. Aggregates from this source are also used for fabrication of pre-stress concrete members. Woodbury Supply Company has

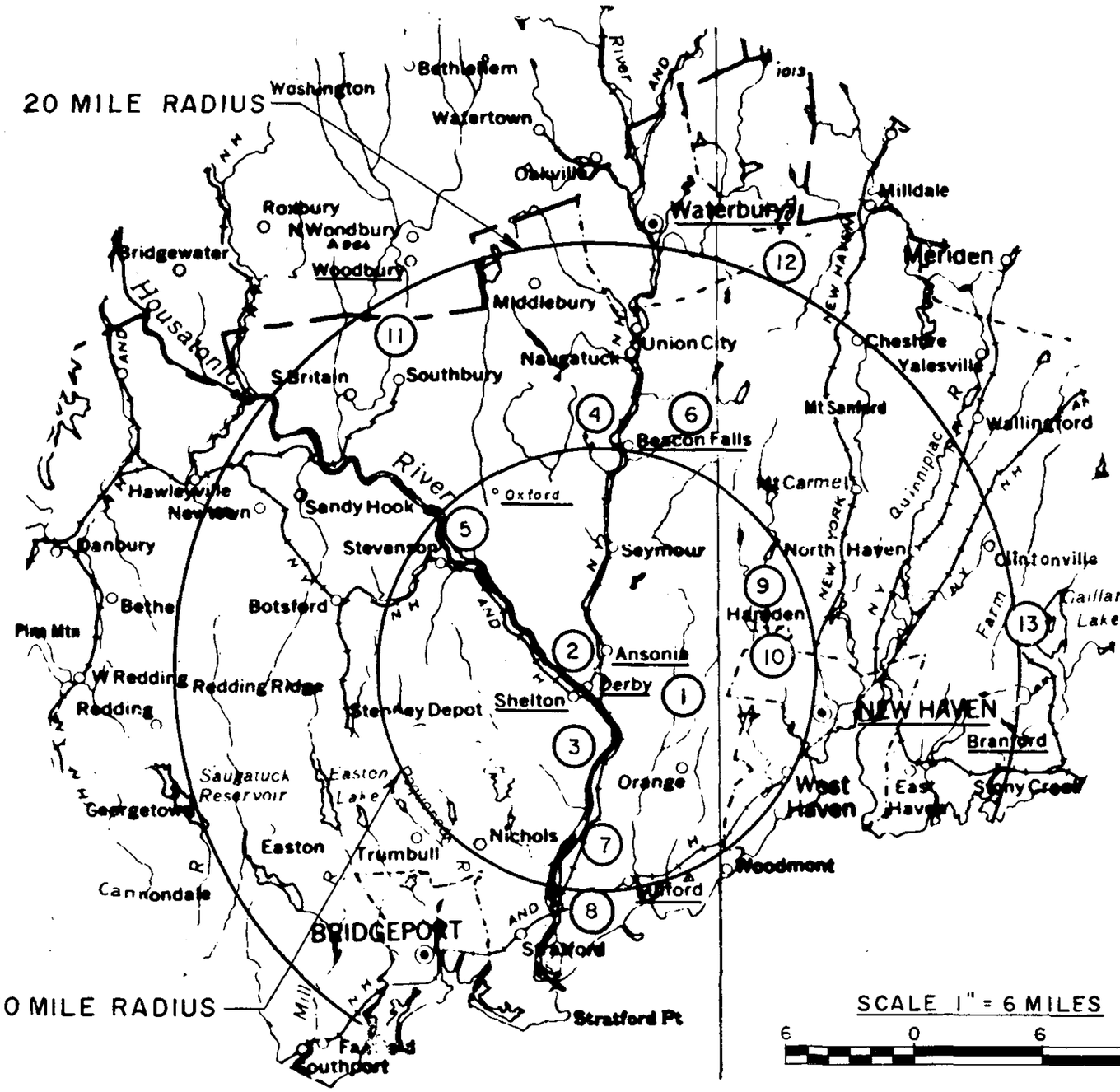
supplied concrete for local construction from their plant located in Woodbury, Connecticut, and the Silliman Company plant located in Bridgeport, Connecticut, including Trumbull Shopping Center, Trumbull, Connecticut, and State Highway bridge construction on Route 1 on the Bridgeport-Fairfield city line. The sand and gravel from Waterbury Sand and Gravel Company has supplied aggregates regularly to a transit mix concrete company located in Waterbury, Connecticut and concrete from this plant has been used in construction of local buildings and highway bridges on Route 8 and I84 in Waterbury. The crushed stone from New Haven Trap Rock Company has been used for many years for concrete pavement and structures in the States of Connecticut, Rhode Island, New York, New York Port Authority, and in Corps of Engineers military projects, including airfield pavements. The performance of aggregates from all sources is considered satisfactory although it must be noted that the period of record is less than 10 years, except New Haven Trap Rock Company is considered excellent based on a fifty year record.

4. Water. It is assumed water for both mixing and curing will be obtained from a city or town water supply and since the exact sources could not be predetermined, tests were not performed. Proposed sources will be tested prior to use.

5. Sources of Concrete. There are eleven sources of ready mixed concrete within a fifteen mile haul distance of the project site. The Beard Concrete Company operates a manual control transit mix type concrete plant located in Derby, Connecticut. Waterbury Ready-Mix Company operates a manual control transit mix type concrete

plant located at the Leverty and Hurley Company pit in Beacon Falls, Connecticut. Clark-Barone, Incorporated operates a semi-automatic control transit mix type concrete plant located in Woodbridge, Connecticut. C. W. Blakeslee and Sons, Incorporated operates two concrete plants, one is a manual control central mix type located in Hamden, Connecticut, the other is an automatic control central mix type located in New Haven, Connecticut. D. J. Carten Sand and Gravel Company operate a manual control transit mix type concrete plant located in Milford, Connecticut. The Silliman Company operates an automatic control central mix type concrete plant located in Bridgeport, Connecticut. D'Addario Service, Incorporated operates an automatic central mix type concrete plant located in Bridgeport, Connecticut. The Foxon Trap Rock Company operates an automatic control transit mix type control concrete plant located in New Haven, Connecticut.

6. Recommendations and Conclusions. Based on the data presented herein, it is considered that aggregate from any of the seven sources tested is acceptable and it is recommended that fine aggregate from five sources and coarse aggregate from seven sources, as listed, be approved.



1. Ansonia - Derby, Local Protection Project
2. Derby Sand and Asphalt Co.
3. Grasso Construction Co.
4. Leverty and Hurley Co.
5. D'Addario Sand and Gravel Co.
6. Hamden Sand and Gravel Co.
7. Beard Sand and Gravel Co.
8. D.J. Carten Sand & Gravel Co.
9. C.W. Blakeslee & Sons, Inc.
10. A.N. Farnham, Inc.
11. Woodbury Supply Co.
12. Waterbury Sand & Gravel Co.
13. New Haven Trap Rock Co.

HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

LOCATION OF COMMERCIAL CONCRETE AGGREGATE SOURCES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4 - 1

STATE: CONN.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Laboratory		
LAT.: 41°N	LONG.: 73°W		DATE: January 1966		

LAB. SYMBOL NO.: 73-96-1 thru 5 TYPE OF MATERIAL: Processed Sand & Gravel

LOCATION: Pine Bridge Road and State Route 8
Beacon Falls, Connecticut

PRODUCER: LEVERTY & HURLEY COMPANY

SAMPLED BY: NED, A. Carosella

TESTED FOR: Ansonia - Derby Local Protection Project

PROCESSING BEFORE TESTING: Crushing, Sizing and Washing by Producer

GEOLOGICAL FORMATION AND AGE: Terrace Pleistocene (Wisconsin)

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE	1½"	3/4"	½"	3/8"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.	100				
1 IN.	60	100			
¾ IN.	17	86	100		
½ IN.	3	19	89		
⅜ IN.		18	46	100	
NO. 4		9	9	34	100
NO. 8			2	6	85
NO. 16				4	61
NO. 30					38
NO. 50					19
NO. 100					6
NO. 200					2.2
- 200(a)	0.6	0.5	0.5	0.7	1.0
F.M.(b)	7.70	6.67	6.44	5.50	2.91

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

	1½"	3/4"	½"	3/8"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):	2.70	2.69	2.69	2.70	2.71
ABSORPTION, PER CENT (CRD-C 107, 108):	0.9	0.9	1.0	1.0	0.9
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	1
SOFT PARTICLES, PER CENT (CRD-C 130):	7	3	4	2	—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):					
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)	3				9
ABRASION LOSS (L. A.), %, (CRD-C 117): "A"	34				—
UNIT WT., LB/CU FT (CRD-C 108):	104	104	100	102	111
CLAY LUMPS, % (CRD-C 118):					
COAL AND LIGNITE, % (CRD-C 122):	—	—	—	—	
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L:					
Rc, mM/L:					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE TT CEMENT, RATIO 7 DAYS, 136 %, 28 DAYS, 129 %

LINEAR THERMAL EXPANSION X10 ⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):

	FINE AGGREGATE				COARSE AGGREGATE			
	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG. Leverty-Hurley	COARSE AGG: Leverty-Hurley	DFE_{300}	64		
FINE AGG.	COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is composed of approximately 38% gneiss, 28% granite, 16% quartz and quartzite, 10% schist, 7% dark basic rock types and 1% miscellaneous with 7% highly weathered. The fine aggregate is composed of approximately 57% quartz and quartzite, 8% feldspar, 5% mica, 2% dark basic rock types, 2% schist and 3% miscellaneous.

REMARKS:

PLATE NO. 4-2

STATE: CONN.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Laboratory
LAT.: 41°N	LONG.: 73°W		DATE: January 1966

LAB. SYMBOL NO.: 73-94-1 thru 3 TYPE OF MATERIAL: Processed Sand & Gravel

LOCATION: State Route 34
Oxford, Connecticut

PRODUCER: D'ADDARIO SAND & GRAVEL COMPANY

SAMPLED BY: NED, A. Carosella

TESTED FOR: Ansonia-Derby Local Protection Project

PROCESSING BEFORE TESTING: Crushing, Sizing and Washing by Producer

GEOLOGICAL FORMATION AND AGE: Kame Terrace ' Pleistocene (Wisconsin)

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE			3/4"	3/8"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN					
1½ IN.					
1 IN.			100		
¾ IN.			93		
½ IN.			65	100	
⅜ IN.			25	97	100
NO. 4			6	29	99
NO. 8				5	85
NO. 16					63
NO. 30					38
NO 50					14
NO. 100					3
NO. 200					
- 200[a]			1.6	1.4	1.3
F.M.[b]			6.58	5.61	2.98

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

			3/4"	3/8"	FINE AGG.
BULK SP. GR, SAT SURF DRY (CRD-C 107,108):			2.74	2.70	2.71
ABSORPTION, PER CENT (CRD-C 107,108):			2.0	2.0	1.7
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	1
SOFT PARTICLES, PER CENT (CRD-C 130):			7	6	—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):			6	1	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)			9		16
ABRASION LOSS (L. A.), %, (CRD-C 117): "B"			29		—
UNIT WT., LB/CU FT (CRD-C 106):			98	96	105
CLAY LUMPS, % (CRD-C 118):					
COAL AND LIGNITE, % (CRD-C 122):	—	—	—	—	
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L:					
Rc, mM/L:					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE II CEMENT, RATIO 7 DAYS, 100 %, 28 DAYS, 105 %

LINEAR THERMAL EXPANSION X10 ⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):

	FINE AGGREGATE				COARSE AGGREGATE			
	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG. D'ADDARIO	COARSE AGG: D'ADDARIO	DFE_{300}	54		
FINE AGG.	COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is composed of approximately 53% basic rock types, 20% granite, 11% gneiss, 8% quartz and quartzite, 6% schist, 1% sandstone and 1% miscellaneous with 11% highly weathered. The fine aggregate is composed of approximately 51% quartz and quartzite, 16% basic rock and minerals, 12% granitic, 8% feldspar, 6% mica, 4% sandstone, 2% schist and 1% miscellaneous.

REMARKS:

PLATE NO. 4-3

STATE: CONN.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Laboratory
LAT.: 41°N	LONG.: 73°W		DATE: January 1966

LAB. SYMBOL NO.: 73-85-1 thru 5 TYPE OF MATERIAL:

LOCATION: Herbert Road, Orange-Milford Line Pit
Milford, Connecticut

PRODUCER: BEARD SAND & GRAVEL COMPANY

SAMPLED BY: NED, A. Caroselle

TESTED FOR: Ansonia-Derby Local Protection Project

PROCESSING BEFORE TESTING: Crushing, Sizing and Washing by Producer

GEOLOGICAL FORMATION AND AGE: Terrace Pleistocene (Wisconsin)

GRADING (CRD-C 136)(CUM. % PASSING):

SIZE	1½"	¾"	⅜"	¼"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.	100				
1 IN.	37	100			
¾ IN.	6	60	100		
½ IN.	3	4	83	100	
⅜ IN.		1	27	99	100
NO. 4			2	10	97
NO. 8				6	89
NO. 16					77
NO. 30					49
NO. 50					22
NO. 100					9
NO. 200					
- 200 (a)	0.4	0.5	0.7	0.6	1.4
F.M. (b)	7.81	7.38	6.68	5.75	2.58

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

	1½"	¾"	⅜"	¼"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 127,128):	2.69	2.67	2.68	2.68	2.71
ABSORPTION, PER CENT (CRD-C 127, 128):	0.9	0.9	1.2	1.2	0.9
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	2
SOFT PARTICLES, PER CENT (CRD-C 130):	3	1	1	2	—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 123):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):	3	1	1	1	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)	4				8
ABRASION LOSS (L. A.), %, (CRD-C 117): WAW	31				—
UNIT WT., LB/CU FT (CRD-C 108):	98	101	99	99	110
CLAY LUMPS, % (CRD-C 142):					
COAL AND LIGNITE, % (CRD-C 122):	—	—	—	—	
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L					
Rc, mM/L					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE II CEMENT, RATIO 7 DAYS, 114 % 28 DAYS, 106 %

LINEAR THERMAL EXPANSION X10 ⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):

	FINE AGGREGATE				COARSE AGGREGATE			
	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):	F & T	HW-CD	HD-CW
FINE AGG. Beard COARSE AGG: Beard DFE 300	57		
FINE AGG. COARSE AGG: DFE 300			

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is composed of approximately 50% granite, 18% quartz and quartzite, 13% gneiss, 10% schist, 4% phyllite and 5% basic rock types with 8% highly weathered. The fine aggregate is composed of approximately 64% quartz and quartzite, 11% feldspar, 9% granitic rock types, 8% mica, 3% schist and 5% basic rock types.

REMARKS:

PLATE NO. 4-4

STATE: CONN. | INDEX NO.: | **AGGREGATE DATA SHEET** | TESTED BY: NED Laboratory

LAT.: 41°N | LONG.: 72°W | DATE: January 1966

LAB. SYMBOL NO.: 73-105-1 thru 5 | TYPE OF MATERIAL: Processed Crushed Stone

LOCATION: Pine Rock Avenue, Hamden, Connecticut

PRODUCER: G. W. BLAKESLEE & SONS, INCORPORATED

SAMPLED BY: NED, A. Carosella

TESTED FOR: Naugatuck-Derby Local Protection Project

PROCESSING BEFORE TESTING: Crushing, Sizing and Washing by Producer

GEOLOGICAL FORMATION AND AGE: Dikes & Sills Triassic

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE	2"	1½"	¾"	⅜"	FINE AGG.
6 IN.					
5 IN.					
4 IN.	---				
3 IN.					
2½ IN.	100				
2 IN.	95				
1½ IN.	47	100			
1 IN.	4	74	100		
¾ IN.		22	86		
½ IN.		5	26	100	
⅜ IN.			4	99	
NO. 4				9	
NO. 8				5	
NO. 16					
NO. 30					
NO. 50					
NO. 100					
NO. 200					
- 200 (a)	0.2	0.4	0.4	2.7	
F.M. (b)	8.19	7.70	7.08	5.37	

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

	2"	1½"	¾"	⅜"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):	2.98	2.98	2.98	2.98	
ABSORPTION, PER CENT (CRD-C 107,108):	0.3	0.6	0.6	0.6	
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	---	---	---	---	
SOFT PARTICLES, PER CENT (CRD-C 123):					---
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 128):					---
PER CENT FLAT AND ELONGATED (CRD-C 119,120):		3	4	9	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)	1				
ABRASION LOSS (L. A.), %, (CRD-C 117): ~~#A~~	14				---
UNIT WT., LB/CU FT (CRD-C 106):	103	98	101	100	
CLAY LUMPS, % (CRD-C 118):					
COAL AND LIGNITE, % (CRD-C 122):	---	---	---	---	
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L					
Rc, mM/L					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE _____ CEMENT, RATIO _____ DAYS, _____ %, _____ DAYS, _____ %

LINEAR THERMAL EXPANSION X10 ⁶/DEG. F. (CRD-C 129,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):

	FINE AGGREGATE				COARSE AGGREGATE			
	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG. Steers	COARSE AGG: Blakeslee	DFE 300	47		
FINE AGG.	COARSE AGG:	DFE 300			

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is 100% diabase which is a medium grained of subophitic texture containing approximately 50% feldspar, 40% pyroxene and 10% miscellaneous.

REMARKS: Soundness in concrete (CRD-C114) There is no evident reason for low result. Aggregate was sound and showed no sign of disintegration. Differences in thermal properties of sand and crushed stone may be a contributing factor.

PLATE NO. 4-5

STATE: CONN. | INDEX NO.: | AGGREGATE DATA SHEET | TESTED BY: NED Laboratory

LAT.: 41°N | LONG.: 73°W | DATE: January 1966

LAB. SYMBOL NO.: 73-104 - 1 thru 5 | TYPE OF MATERIAL: Processed Sand & Gravel

LOCATION: Stiles Road, off State Route 67
Woodbury, Connecticut

PRODUCER: WOODBURY SUPPLY COMPANY

SAMPLED BY: NED, A. Carosella

TESTED FOR: Ansonia-Derby Local Protection Project

PROCESSING BEFORE TESTING: Crushing, Washing and Sizing by Producer

GEOLOGICAL FORMATION AND AGE: Glacial Outwash Pleistocene (Wisconsin)

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE	1¼"	3/4"	1/2"	3/8"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.	100				
1 IN.	80	100			
¾ IN.	18	92	100		
½ IN.	5	37	98	100	
⅜ IN.		7	32	96	
NO. 4			2	18	100
NO. 8				3	91
NO. 16					73
NO. 30					50
NO. 50					25
NO. 100					8
NO. 200					
-200[a]	1.0	0.7	0.6	0.6	3.1
F.M.[b]	7.62	6.99	6.61	5.81	2.53

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

	1¼"	3/4"	1/2"	3/8"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):	2.69	2.73	2.66	2.67	2.69
ABSORPTION, PER CENT (CRD-C 107,108):	1.4	1.9	1.7	1.6	1.3
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	1
SOFT PARTICLES, PER CENT (CRD-C 130):	3	3	6	2	—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):	3	1	2	0	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)	5				14
ABRASION LOSS (L. A.), %, (CRD-C 117): "A"	35				—
UNIT WT., LB/CU FT (CRD-C 108):	102	101	99	100	106
CLAY LUMPS, % (CRD-C 118):					
COAL AND LIGNITE, % (CRD-C 122):	—	—	—	—	
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L:					
Rc, mM/L:					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE II CEMENT, RATIO 7 DAYS, 132 %, 28 DAYS, 120 %

LINEAR THERMAL EXPANSION X10 ⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):

	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114): F & T | HW-CD | HD-CW

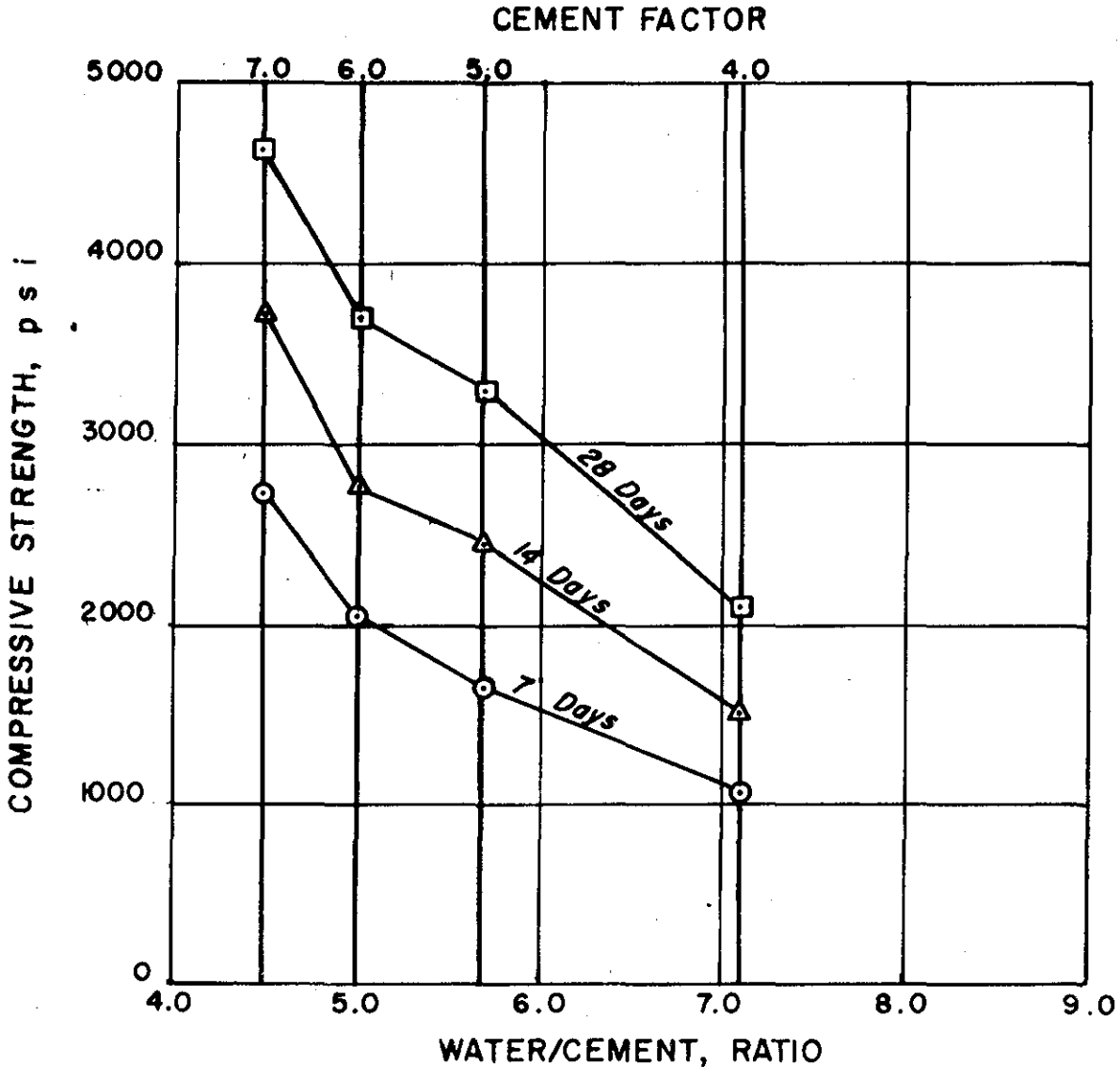
FINE AGG. Woodbury COARSE AGG: Woodbury DFE 300: 51

FINE AGG. COARSE AGG: DFE 300:

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is composed of approximately 26% basic rock types, 18% gneiss, 16% quartz and quartzite, 14% granite, 14% schist, 6% sandstone, 4% feldspar and 2% miscellaneous with 8% highly weathered. The fine aggregate is composed of approximately 61% quartz and quartzite, 10% basic rock types, 10% feldspar, 6% mica, 4% granitic varieties, 4% schist, 3% sandstone and 2% miscellaneous.

REMARKS:

PLATE NO. 4-6



LEVERTY & HURLEY CO.

BEACON FALLS, CONNECTICUT

NOTE

Concrete with 1 1/4" maximum size coarse aggregate, 3-inch slump, 5.5% entrained air, type II portland cement.

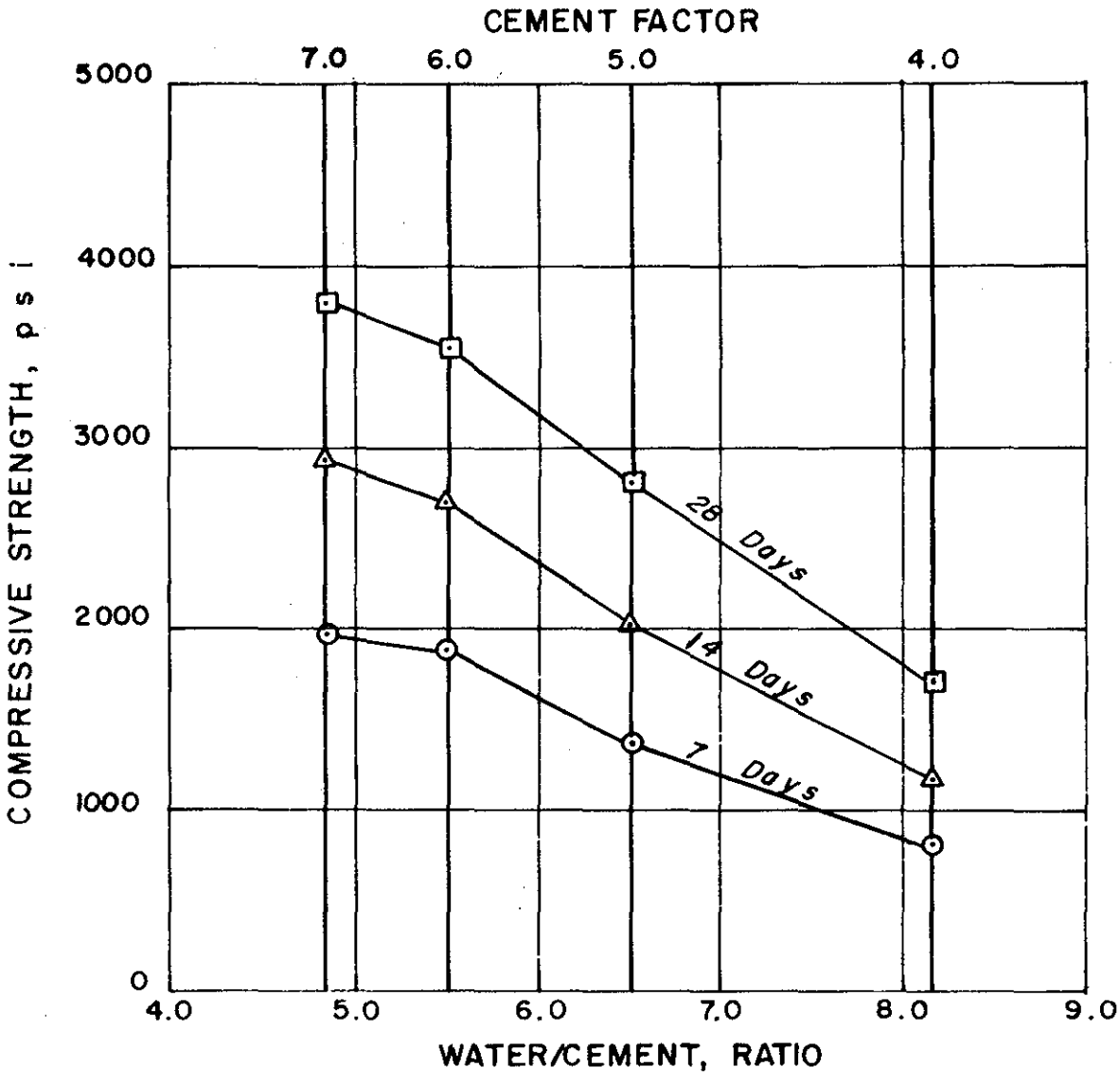
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

CONCRETE MAKING PROPERTIES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4-7



D'ADDARIO SAND & GRAVEL CO.

OXFORD, CONNECTICUT

NOTE

Concrete with 3/4" maximum size coarse aggregate, 3 - inch slump, 5.5% entrained air, type II portland cement.

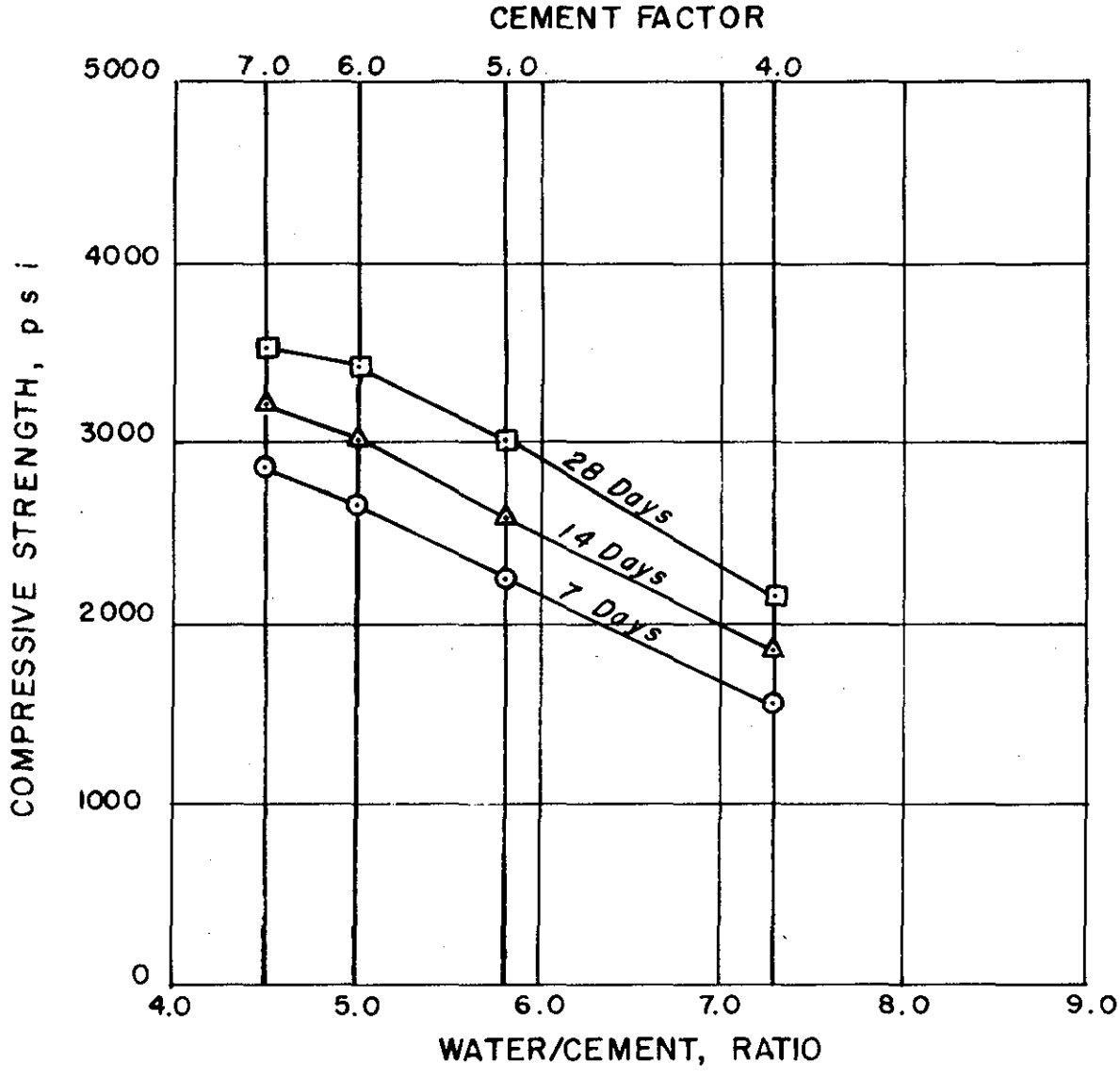
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

CONCRETE MAKING PROPERTIES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4-8



BEARD SAND & GRAVEL CO.

MILFORD - ORANGE LINE PIT

MILFORD, CONNECTICUT

NOTE

Concrete with 1 1/4" maximum size coarse aggregate, 3 - inch slump, 5.5% entrained air, type II portland cement.

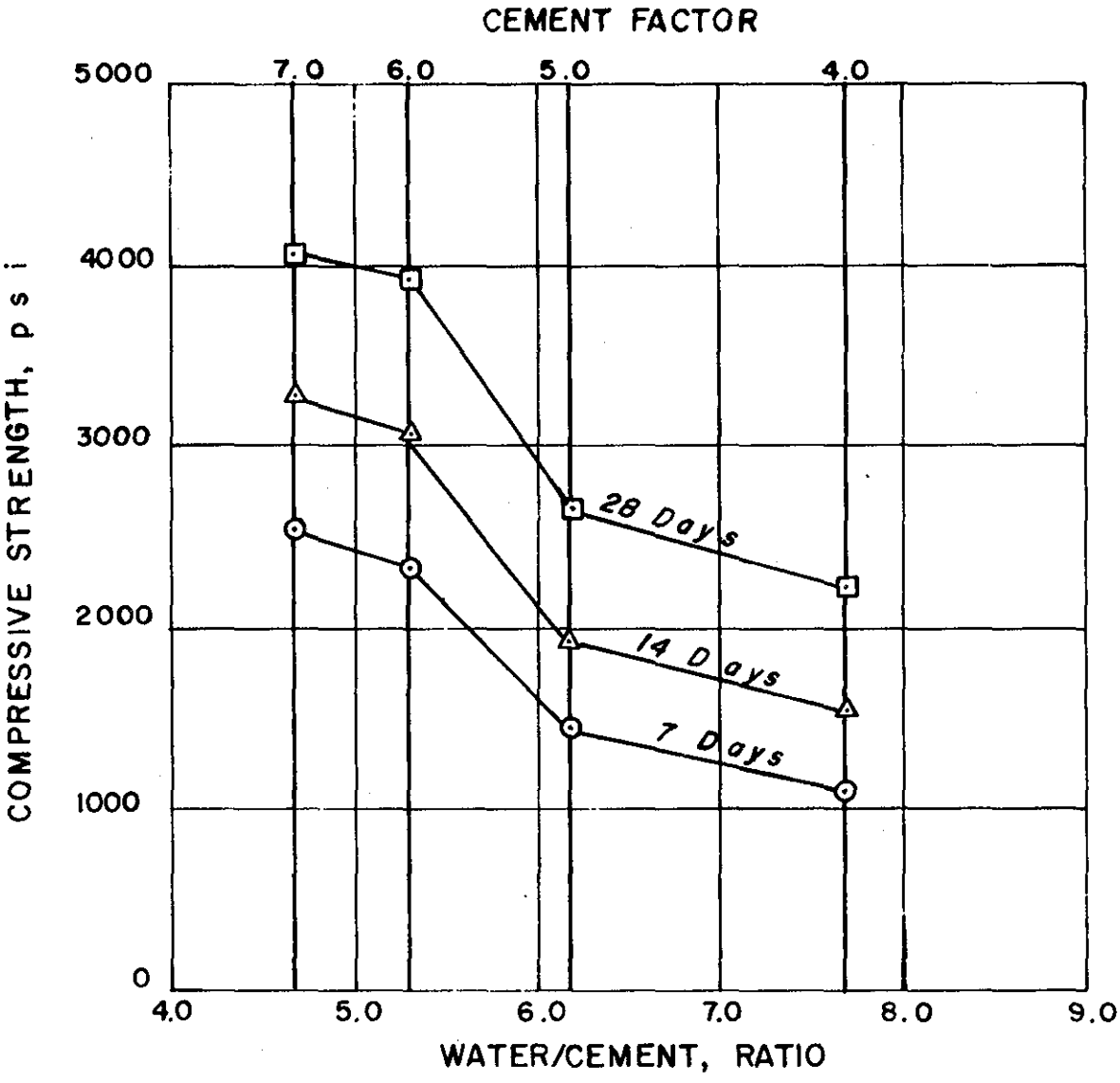
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

CONCRETE MAKING PROPERTIES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4 - 9



WOODBURY SUPPLY CO.

WOODBURY, CONNECTICUT

NOTE

Concrete with 1 1/4" maximum size coarse aggregate, 3 - inch slump, 5.5% entrained air, type II portland cement.

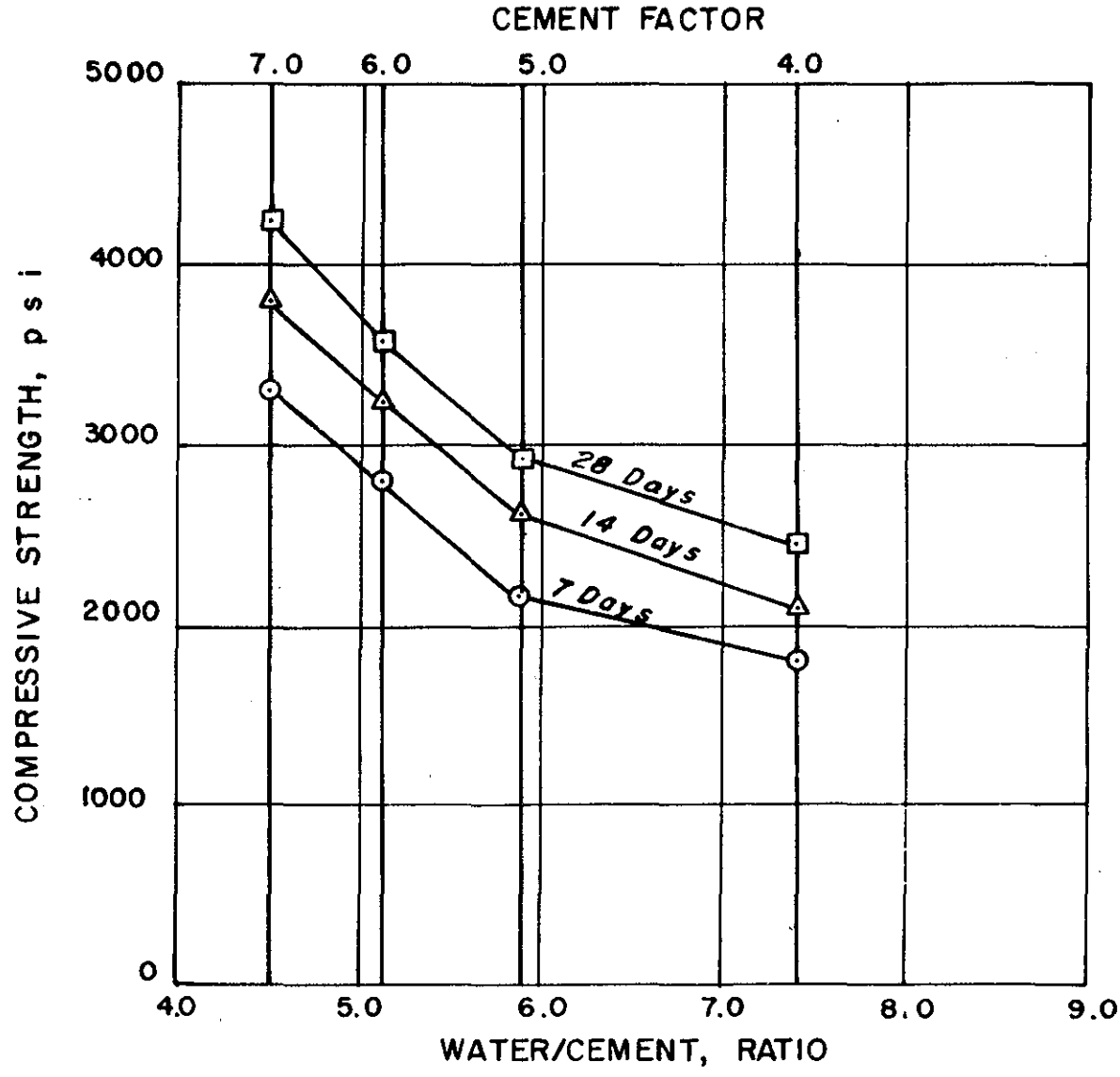
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

CONCRETE MAKING PROPERTIES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4 - 10



FINE AGGREGATE

STEERS SAND & GRAVEL CORP.

NORTHPORT, L.I., NEW YORK

COARSE AGGREGATE

NEW HAVEN TRAP ROCK CO.

NORTH BANFORD, CONNECTICUT

NOTE

Concrete with 1 1/4" maximum size coarse aggregate, 3-inch slump, 5.5% entrained air, type V portland cement.

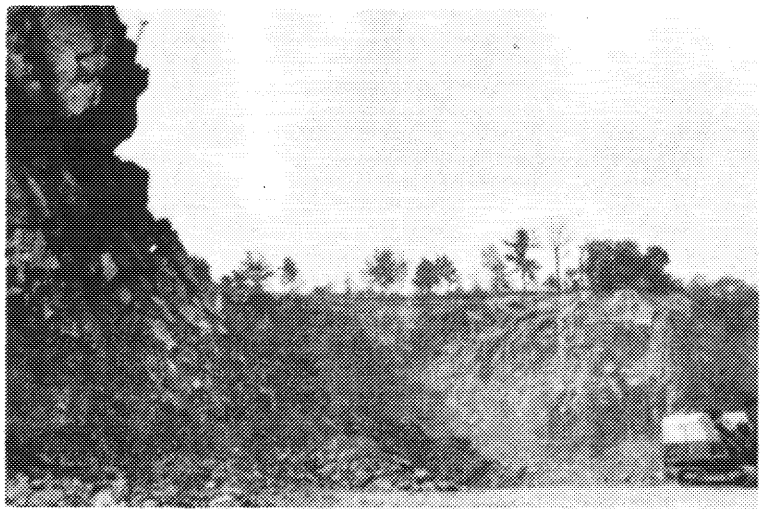
HOUSATONIC RIVER FLOOD CONTROL

ANSONIA - DERBY

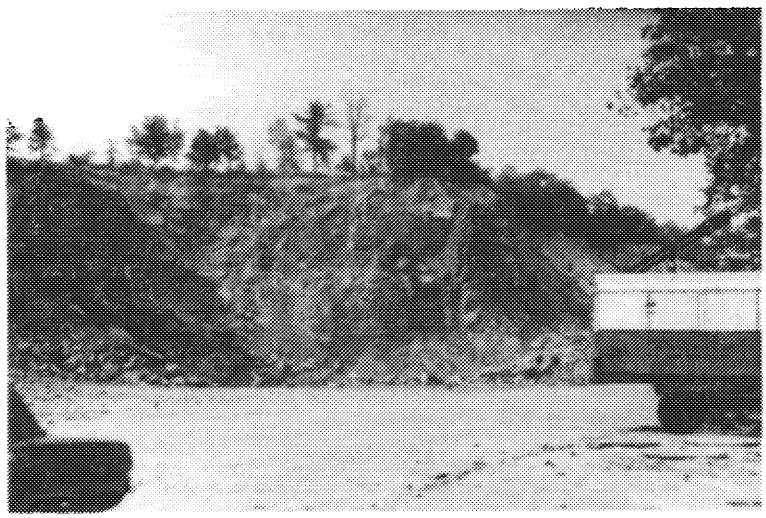
CONCRETE MAKING PROPERTIES

NAUGATUCK RIVER CONNECTICUT

PLATE NO. 4-11

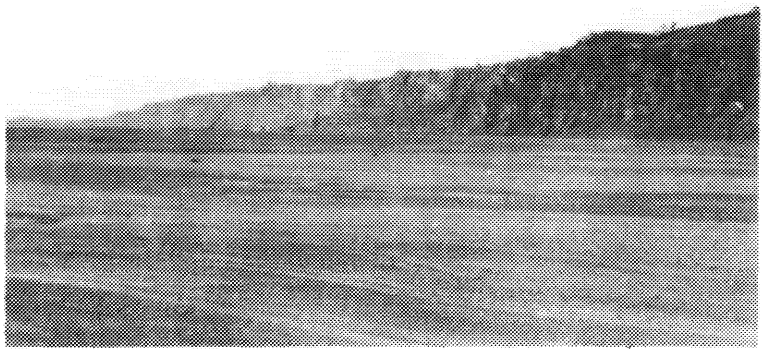


C. W. BLAKESLEE & SONS, INCORPORATED
Hamden, Connecticut
Quarry face 500 feet long

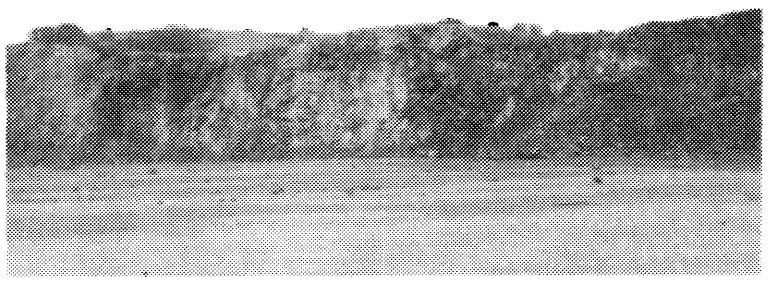


C. W. BLAKESLEE & SONS, INCORPORATED
Hamden, Connecticut
Quarry face 200 feet high

PLATE NO. 4-12



NEW HAVEN TRAP ROCK COMPANY
North Branford, Connecticut
Quarry face one mile long



NEW HAVEN TRAP ROCK COMPANY
North Branford, Connecticut
Quarry face 130 feet high

PLATE NO. 4-13